

## **Appendix C – Flow Measurements, Precipitation, Water Withdrawals, Dam Operations, and Habitat Assessment Data**

LAMPREY RIVER BASELINE FISH SAMPLING  
AUGUST 25-29, 2003

**C-1 – [Precipitation and Stream Flow Data](#)**

**C-2 – [Dam Operations](#)**

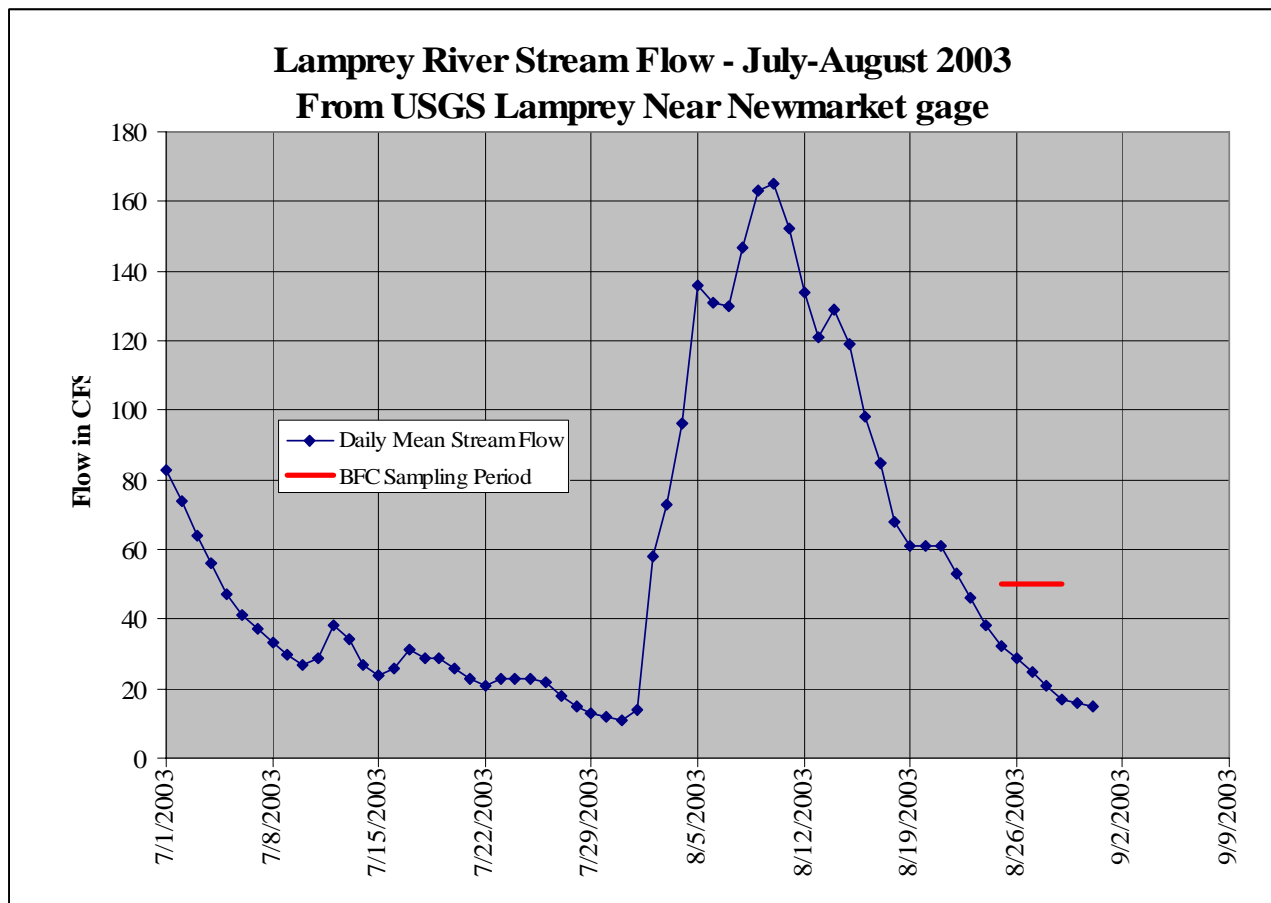
**C-3 – [Water Withdrawals](#)**

**C-4 – [Habitat Assessments](#)**

## **C-1 – Precipitation and Stream Flow Data**

### **Flow at USGS gage on the Lamprey River**

Stage in the Lamprey River is recorded by a USGS gage known as LAMPREY RIVER NEAR NEWMARKET, NH near Packers Falls in Durham NH. Stage, streamflow and other data can be downloaded for the gage at <http://waterdata.usgs.gov/nh/nwis/uv?01073500>. Flow data was collected for the project from the USGS website for the period prior to and during the project. Flows in July were mainly well below 40 cfs. In early August 2003 flows were briefly over 160 cfs, but during the BFC sampling period of August 25-29, 2003, the daily flows recorded at this gage began at 32 cfs and dropped to 17 cfs (Figure 1). The 69 years of record at the site show that average daily flow during August 25 through 29 ranges between 53 and 60 cfs.



**Figure 1 - Lamprey River Flow during the BFC Sampling**

### **BFC Project-specific flow data**

Flow measurements were made at eleven backpack or barge stations using Marsh-Birney flow meters (Table 1). No measurements were taken by the boat electrofishing or net teams because the greater depth and lower velocities expected at these stations were not suitable for the Marsh-Birney meter. The eleven stations were measured during the first four days (August 25 through 28) of the sampling program. All barge and backpacking stations were completed by August 28, 2003. Only two of the flow measurements made by the barge and backpacking teams were downstream of Wiswall Dam, somewhat reflective of the distribution of habitat conditions (that is, most

riffle/shallow reaches occur above Wiswall Dam), but also because there are 8.7 miles of Designated River above Wiswall Dam and 3.1 miles below (NHDES GIS).

**Table 1 - BFC Lamprey River - Flow measurements**

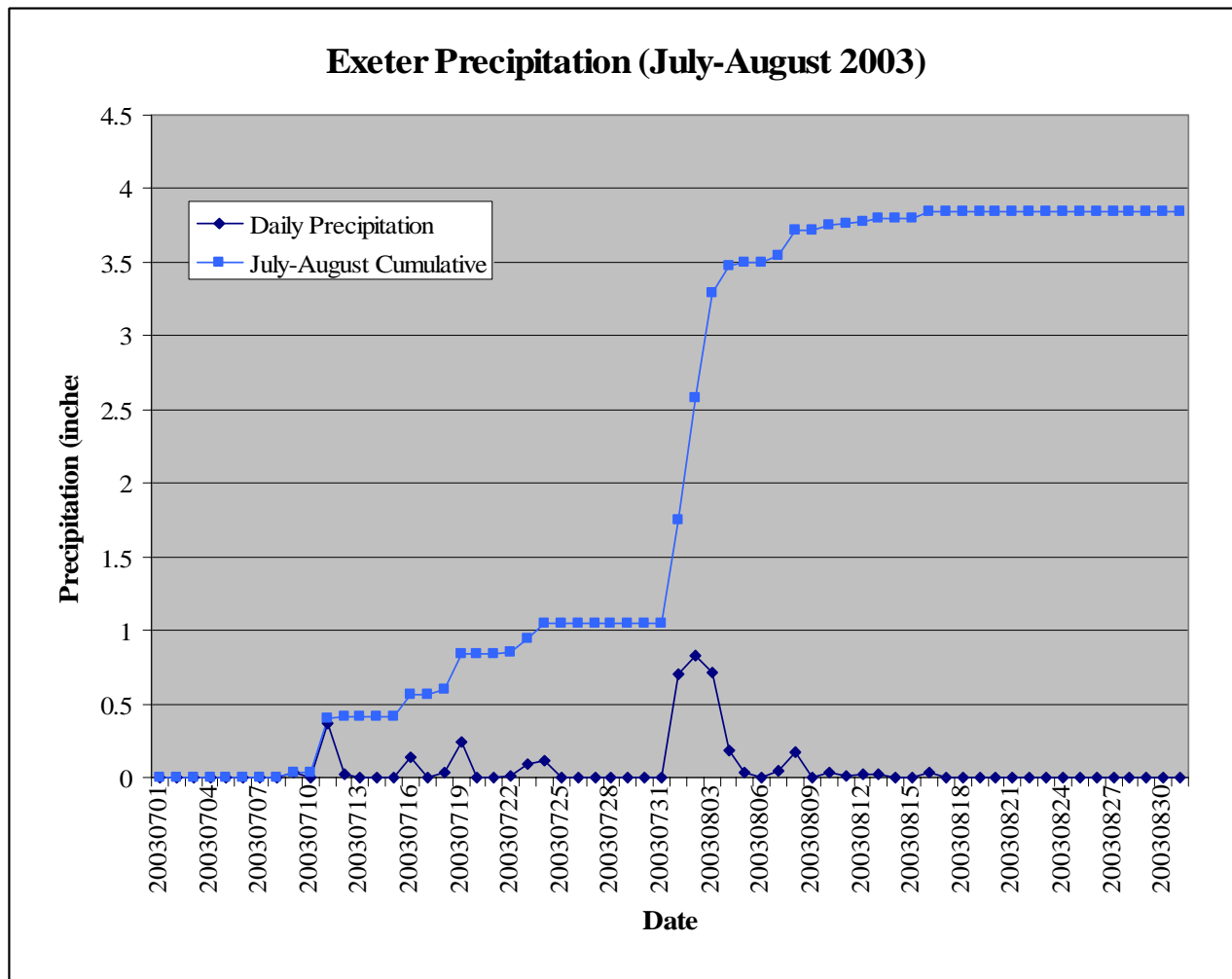
<b>Station</b>	<b>Flow (cfs)</b>	<b>Date</b>	<b>Start Time</b>	<b>River width (feet)</b>	<b>Maximum measured depth (feet)</b>	<b>Maximum measured velocity (feet per second)</b>	<b>Location relative to Wiswall Dam</b>
03P-102	33.5	8/25/2003	13:15	28	2.42	1.33	U/S
03P-111	20.8	8/25/2003	12:37	90	2.3	0.27	U/S
03P-112	27.3	8/25/2003	15:45	48	1.8	0.99	U/S
03P-113	24.1	8/26/2003	15:57	59	2.4	0.57	U/S
03P-114	25.3	8/26/2003	12:55	68	3.0	0.33	U/S
03P-115	25.8	8/26/2003	10:51	40	1.1	1.65	U/S
03P-104	24.7	8/27/2003	11:05	62	2.53	0.44	D/S
03P-116	21.4	8/27/2003	14:00	74	3.5	0.19	U/S
03P-117	22.7	8/27/2003	10:45	49	3.2	0.36	U/S
03P-105	22.4	8/27/2003	14:29	44	1.6	1.20	D/S
03P-101	15.5	8/28/2003	13:40	50	1.4	0.91	U/S

### Precipitation

A period of abnormally dry to drought conditions persisted for the two years preceding the BFC sampling program. In March 2002 the NH Drought Management Team had elevated its official classification of New Hampshire's low water conditions to a Drought Emergency (<http://www.des.state.nh.us/press/press031402.htm>). National Oceanic and Atmospheric Administration's (NOAA - <http://www.noaa.gov/>) Climate Prediction Center classified conditions in New Hampshire as Abnormally Dry to Severe Drought frequently since 2001. <http://www.drought.unl.edu/dm/archive/2001/drmon0828.gif>.

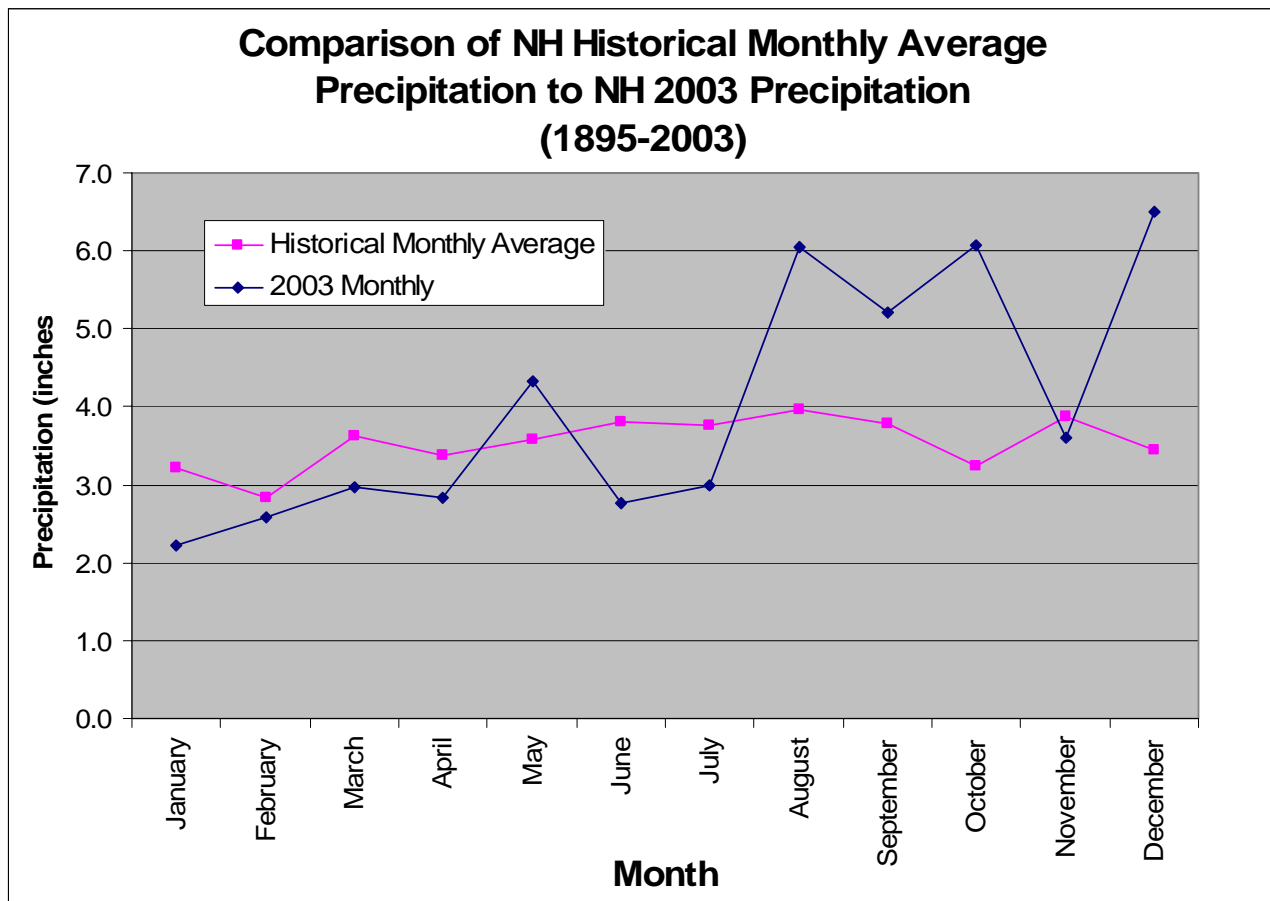
Precipitation data for the period during and prior to the BFC sampling was collected from the Exeter River gage USGS 01073587 EXETER RIVER AT HAIGH ROAD, NEAR BRENTWOOD, NH at [http://waterdata.usgs.gov/nh/nwis/uv/?site\\_no=01073587&PARAMeter\\_cd=00045](http://waterdata.usgs.gov/nh/nwis/uv/?site_no=01073587&PARAMeter_cd=00045). There was no rain recorded during the BFC sampling period or the week preceding it at the Exeter precipitation gauge. However, approximately four inches of rain fell in early August 2003 causing the higher stream flows early in the month which declined slowly through the sampling period. Daily and cumulative rainfall for the July-August 2003 period are shown below (Figure 2). The Exeter gage is about 10 miles southwest from the Packers Falls gage and 7 miles from the beginning of the Designated River.

Historical precipitation data was collected for Rochester, NH from NOAA National Weather Service Forecast Office at <http://www.erh.noaa.gov/er/box/dailystns.shtm> showing the August 2003 precipitation in Figure 8 below. These data show monthly 2003 precipitation below the historical average for six of the first seven months of 2003. August 2003 precipitation was above average.



**Figure 2 - July - August 2003 precipitation at Exeter River**

Data for the above graph is from USGS precipitation gage at USGS 01073587 EXETER RIVER, AT HAIGH ROAD, NEAR BRENTWOOD, NH. The Lamprey BFC fish sampling occurred August 25 through August 29, 2003.

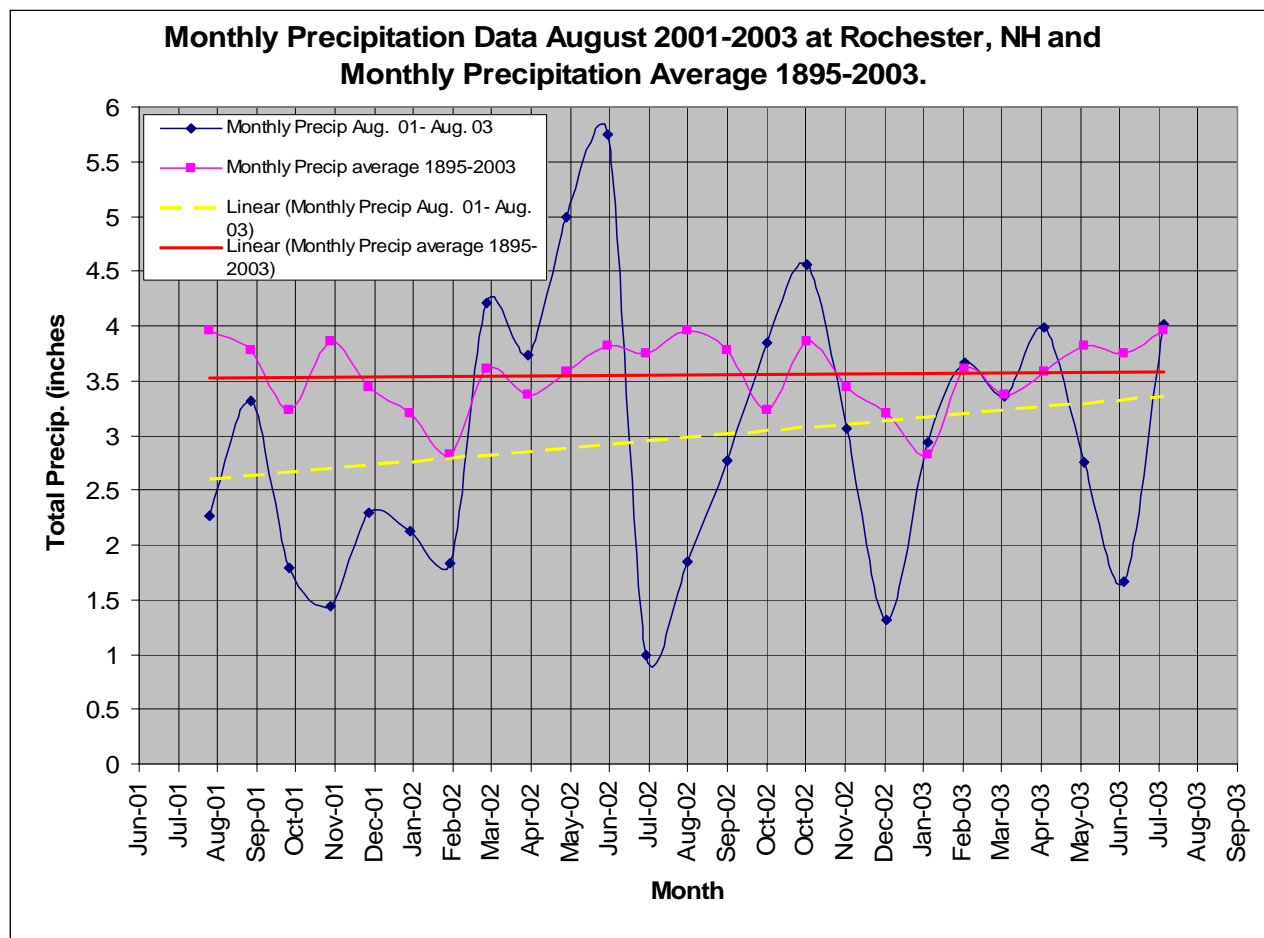


**Figure 3 - 2003 Rochester Monthly Precipitation versus Historical Monthly Averages**

Source data from:

<http://climvis.ncdc.noaa.gov/cgi-bin/cag3/hr-display3.pl>

<http://www.ncdc.noaa.gov/oa/climate/research/cag3/NH.html>



**Figure 4 - Historical and Recent Precipitation Levels at Rochester, NH Gaging Station**

Historical monthly average precipitation for NH between 1895 and 2003 (Table 2) compared with that of August 2001-2003 from Rochester weather station. The NH data represents an area-weighted average of the New Hampshire climate division. An EXCEL linear trend line was added to each data set. The trend line for August 2001-August 2003 shows the recent drought conditions as compared to the historical trend line. The trend lines indicate the average departure from normal was about a half an inch per month low for the two years previous to the BFC. Data sources were

<http://www.erh.noaa.gov/er/box/dailystns.shtm> and <http://www.ncdc.noaa.gov/oa/climate/research/cag3/NH.html>

**Table 2 - NH precipitation data from NOAA National Climate Data Center**

Source: <http://climvis.ncdc.noaa.gov/cgi-bin/cag3/hr-display3.pl>  
<http://www.ncdc.noaa.gov/oa/climate/research/cag3/NH.html>

Year	January	February	March	April	May	June	July	August	September	October	November	December
<b>Historical Monthly Average</b>	<b>3.21</b>	<b>2.83</b>	<b>3.61</b>	<b>3.37</b>	<b>3.58</b>	<b>3.81</b>	<b>3.75</b>	<b>3.96</b>	<b>3.78</b>	<b>3.24</b>	<b>3.86</b>	<b>3.45</b>
2003	2.23	2.58	2.97	2.84	4.32	2.77	2.99	6.05	5.2	6.08	3.61	6.51
2002	2.38	3.05	3.8	4.31	4.4	6.21	1.9	1.93	3.7	3.51	4.51	3.47
2001	1.41	3.05	6.13	0.96	1.79	4.82	3.33	1.78	4.07	1.63	2.02	2.43
2000	3.57	3.5	3.64	6.27	4.13	3.57	4.74	2.88	3.09	2.79	3.73	4.13
1999	6.43	1.81	4.98	0.73	3.45	2.79	3.66	3	9.38	3.94	2.9	1.86
1998	5.03	3.15	3.72	2.34	3.26	9.89	3.4	3.05	2.64	4.31	3.05	1.52
1997	3.35	2.28	3.88	4.14	3.05	2.18	4.25	4.68	2.27	1.66	5.91	2.72
1996	4.75	3.14	2.18	6.62	5.25	3.28	7.19	0.96	3.67	8.24	2.47	6.01
1995	3.49	2.5	2.5	1.88	2.87	1.59	4.51	2.67	2.62	8.33	5.55	2.85
1994	4.41	1.32	4.69	3.2	4.26	3.01	4.18	3.75	4.7	0.87	2.92	4
1993	2.36	2.81	4.35	4.03	1.35	3.12	2.99	3.16	4.49	3.21	3.88	3.94
1992	2.47	2.03	3.46	2.51	1.63	3.79	4.29	3.91	3.4	2.85	4.49	2.45
1991	2.5	1.72	3.55	3.36	3.27	2.64	2.42	8.38	5.27	4.28	3.65	3.43
1990	4.35	3.09	2.05	3.58	5.59	4.33	3.03	8.46	2.29	6.96	3.35	4.93
1989	1.29	2.19	2.52	3.28	5.63	5.26	3.12	5.1	4.26	5.12	4.88	1.34
1988	2.02	2.74	1.56	3.99	3.62	1.68	6.18	5.61	2.05	2.08	5.48	1.31
1987	3.51	0.23	2.58	6.07	1.9	5.97	3.07	2.8	5.25	4.54	2.48	2.15
1986	5.42	2.23	3.72	1.88	2.95	4.75	5.39	4.39	3	2.01	4.42	3.92
1985	1.09	2.5	2.8	1.71	3.12	3.25	2.34	4.42	4.38	2.9	5	1.9
1984	1.68	4.4	3.67	3.8	9.58	3.5	4.85	1.73	1.45	3.57	3.2	3.35
1983	4.11	2.64	6.36	5.63	5.84	2.15	2.39	4.98	1.84	3.38	8.27	5.79
1982	3.41	2.88	2.66	3.45	1.87	6.79	2.66	3.12	2.57	1.91	3.89	1.57
1981	0.6	7.86	1.05	3.29	3.66	3.69	5.5	3.9	5.08	5.53	2.72	4.2
1980	0.97	0.86	4.4	4.05	1.48	3.14	3.36	2.81	3.69	3.72	3.72	1.38
1979	7.88	2.08	3.1	3.67	5.44	1.27	3.52	4.72	3.7	4.6	3.23	2.09
1978	6.61	1.06	2.24	2.65	3.07	5.2	2.24	3.17	1.25	3.48	1.91	3.15
1977	2.76	2.25	4.81	3.88	1.91	4.77	2.03	3.96	5.83	6.42	3.72	4.9
1976	4.28	3.2	3.04	2.78	4.9	2.8	4.98	4.76	3.14	5.4	1.61	2.78
1975	3.61	2.54	3	2.87	1.74	4.01	5.44	4.47	5.44	5.25	4.9	4.05

1974	3.15	2.3	4	3.47	5.28	2.69	3.06	3.12	5.5	1.72	3.85	3.71
1973	3.59	2.01	2.71	5.36	5.52	6.86	3.7	4.12	2.78	3.21	3.06	8.72
1972	1.86	3.61	4.89	2.77	3.76	5.21	5.28	2.9	2.1	3.17	5.93	5.88
1971	2.15	3.74	3.01	1.84	3.41	2.41	4.29	4.21	2.65	2.93	3.67	3.3
1970	0.72	4.33	3.21	3.45	3.54	2.84	2.66	3.73	4.05	3.68	2.95	3.93
1969	2.06	5.24	2.76	3.84	2.37	4.05	5.42	3.78	3	1.96	6.62	7.41
1968	2.23	1.24	4.05	3.28	4.45	5.9	1.99	2.25	2.63	2.45	5.83	6.06
1967	1.51	2.99	1.96	4.09	5.37	3.33	4.28	2.98	2.92	2.69	3.14	4.5
1966	3.36	2.43	2.87	1.22	2.91	3.06	2.85	4.2	4.09	3.33	3.88	2.94
1965	1.52	3.32	0.96	2.27	1.06	3.55	2.52	3.08	4.11	3.46	3.43	1.89
1964	4.37	1.83	3.88	2.88	2.42	1.77	3.49	3.61	1.01	2.32	3.7	3.47
1963	2.64	2.52	2.94	2.22	2.99	1.97	2.53	4.12	2.34	1.21	7.99	2.17
1962	2.49	2.98	2	3.69	2.96	2.67	4.58	4	3.2	7.75	3.38	3.65
1961	1.43	2.79	2.31	4.51	3.23	3.2	4.14	2.93	3.05	2.22	3.88	3.11
1960	2.79	4.1	2.52	4.29	4.54	3.69	4.37	1.99	6.64	3.56	2.84	2.35
1959	3.41	2.59	3.43	2.45	1.37	4.6	2.47	4.83	2.45	7.22	5.81	3.63
1958	7.07	2.63	2.27	4.05	3.09	2.18	4.88	2.22	3.47	3.23	3.56	1.46
1957	2.06	1.24	1.44	1.99	3.17	3.41	4	1.47	2.63	2.57	5.1	5.54
1956	4.73	2.98	4.54	3.28	3.06	2.55	4.07	2.35	4.84	1.81	2.88	3.96
1955	0.94	4.04	3.65	2.45	2.93	4.46	1.81	6.96	1.72	5.14	3.49	1.12
1954	2.75	3.21	3.81	4.44	7.8	4.92	3.39	4.57	7.78	2.88	4.91	3.91
1953	4.52	2.59	7.65	4.38	4.3	1.31	2.9	3.98	2.17	3.87	3.05	3.82
1952	3.78	3.42	2.98	3.87	4.24	5.14	2.46	3.11	3.17	2.07	2.02	5.64
1951	2.33	4.85	4.56	4.54	3.19	2.75	5.57	3.76	3.52	3.63	5.67	4.16
1950	4.26	2.55	3.7	2.95	1.91	3.78	2.01	4.39	2.57	2.49	6.32	3.61
1949	3.78	2.32	2.03	3.19	3.77	2.56	2.92	3.17	4.67	2.36	2.94	2.14
1948	2.57	1.8	2.58	3.36	5.94	3.78	3.2	2.86	0.89	2.34	6.23	2.94
1947	3.72	2.41	3.35	2.63	4.87	5.64	5.12	1.49	1.91	0.7	5.14	2.13
1946	3.1	2.54	1.39	2.78	4.73	2.85	3.41	6.48	4.12	2.92	2.09	3.86
1945	3.9	3.04	1.79	4.56	6.54	5.4	5.25	1.59	3.86	4	4.99	4.55
1944	1.92	2.51	3.39	3.18	1.73	6.42	3.66	1.53	6.19	2.97	3.39	2.81
1943	1.88	1.77	2.38	3.49	4.6	3.95	5.03	5.15	1.84	5.04	5.97	0.94
1942	2.3	2.32	5.73	2.42	2.62	5.07	4.13	1.79	4.03	2.53	4.65	4.44
1941	1.88	2.05	1.79	0.59	2.91	2.76	5.13	2.5	1.75	3.06	2.96	2.9
1940	1.87	2.41	3.84	4.6	5.14	3.09	4.46	1.88	4.24	0.84	5.87	3.32
1939	2.72	2.8	3.35	4.47	1.94	3.54	2.57	3.4	2.76	4.18	0.68	2.76
1938	3.82	2.16	2.24	2.62	3.03	4.16	7.7	3.61	9.81	2.38	2.9	4.24
1937	3.74	2.93	3.16	3.81	5.8	4.97	3.17	3.31	2.86	4.69	5.43	3.46
1936	5.93	2.25	9.27	4.07	2.53	2.33	3.26	3.75	2.19	5.03	2.15	6.03
1935	5.69	2.37	1.5	2.81	2.28	5.96	3.16	2.26	4.92	1	4.48	1.24

1934	2.87	2.25	2.67	4.72	2.68	3.88	3.82	1.99	6.36	2.19	3.49	3.44
1933	2.36	3.03	4.71	6.74	2.28	2.2	3.18	5.41	3.82	4.54	1.81	3.19
1932	4.18	2.13	3.15	2.68	1.77	2.15	4.15	3.62	6.01	3.57	4.71	1.42
1931	2.09	1.5	2.89	2.63	3.92	4.97	4.63	3.76	3.96	3.15	1.35	3.71
1930	3.09	1.86	5.31	1.72	4.65	4.19	4.13	3.99	1.85	2.54	3.28	1.65
1929	3.98	3.7	4.43	4.85	5.07	4.52	2.16	4.12	2.65	2.27	2.81	3.99
1928	3.23	2.77	2.75	3.7	4.55	4.26	3.78	7.03	3.86	2.2	2.79	2.51
1927	2.77	3.33	1.69	1.37	4.03	2.58	4.54	5.24	2.61	4.7	9.27	4.95
1926	2.92	3.62	2.81	3.45	1.57	3.61	3.67	4.15	3.11	4.09	5.12	2.69
1925	2.86	3.19	5.97	2.08	2.53	4.96	4.24	1.76	4.56	4.03	4.03	2.49
1924	4.05	2.24	1.08	5.34	3.13	2.43	2.84	5.12	7.4	0.31	4.18	2.18
1923	4.79	1.61	2.96	5.91	2.2	2.5	3.25	3.12	3.1	3.18	5.69	3.99
1922	2.39	3.13	6.32	3.49	4.44	10.35	2.69	5.88	2.55	1.98	1.56	3.05
1921	1.76	2.52	3.94	4.09	2.05	3.69	4.23	3.83	2.77	2.38	6.32	2.57
1920	2.19	4.55	4.77	6.22	2.68	3.8	3.96	5.48	7.3	1.27	4.55	6.81
1919	3.02	1.9	5.46	2.35	5.4	2.37	2.26	4.29	5.4	3.87	5.48	1.72
1918	2.81	2.6	2.22	2.38	3.62	3.77	2.66	5.31	8	3.14	2.84	3.72
1917	3.55	1.93	3.78	2.4	3.41	8.07	2.02	5.28	0.96	5.17	0.83	3.19
1916	1.73	4.21	3.52	3.81	4.51	7.23	4.28	4.12	5.69	1.16	3.57	3.41
1915	4.5	4.09	0.23	2.63	1.53	2.31	9.82	7.55	1.73	2.18	2.98	4.67
1914	2.99	2.09	5.28	6.5	1.84	2.52	3.31	5.97	0.77	1.17	2.87	2.52
1913	3.14	2.81	6.83	2.47	4.4	0.89	2.62	3.44	2.75	4.99	2.29	2.89
1912	3.1	2.14	5.81	3.11	5.77	1.22	3.06	5.66	4.38	2.93	3.62	4.14
1911	2.35	2.75	4.14	1.24	1.43	2.81	4.8	5.28	3.81	3.69	3.28	3.32
1910	4.33	4.69	1.58	3.22	3.23	3.85	1.9	4.33	3.78	1.26	3.06	2.73
1909	4.69	4.44	3.52	3.54	2.94	3.21	2.21	3.72	4.88	1.1	2.64	2.76
1908	2.9	4.04	2.58	2.47	5.19	1.25	3.72	5.93	0.93	1.82	1.27	3.2
1907	2.32	1.64	2.47	3.34	2.87	3.52	3.8	2.18	8.69	4.1	4.61	3.9
1906	2.87	2.19	4.37	2.32	7.06	5.92	4.34	2.65	1.42	2.89	2.71	3.79
1905	4.43	1.47	3.24	2.06	2.02	5	3.78	5.24	7.12	1.12	2.56	4.46
1904	3.98	2.02	3.03	6.41	4.31	2.91	2.52	5.16	5.9	1.8	1.51	1.82
1903	3.98	4.19	6.63	1.9	0.69	8.02	3.69	4.54	1.45	2.88	1.64	3.29
1902	3.11	3.1	6.71	4.74	3.88	4.61	4.18	5.89	5.42	4.09	1.27	5.95
1901	2.16	0.81	5.52	6.15	6.55	2.22	4.53	5.52	3.27	2.78	1.95	8.02
1900	5.65	8.07	6.78	1.38	3.52	2.69	2.66	4.2	3.75	3.11	6.82	2.52
1899	3.19	3.31	7.61	1.42	1.53	2.72	4.59	2.33	4.25	0.98	2.32	2.23
1898	5.84	4.96	1.43	3.96	3.55	3.99	2.27	6.62	4.6	4.66	5.24	2.88
1897	4.13	2.72	4.55	2.62	5.5	6.58	7.33	3.94	2.02	1.15	6.82	5.13
1896	1.28	5.35	8.93	1.35	2.61	2.4	3.58	4.13	5.94	3.5	3.86	1.46
1895	3.41	2.21	3	2.95	2.81	2.58	3.16	5.48	2.87	1.6	5.62	4.51

## **C-2 – Dam Operations**

### **Dam Operations**

Discussion with NHDES Dam Bureau personnel and review of the log books of the state-owned and operated dams showed that none of the operations at state dams were changed during the month of August. There are 22 dams with impoundments greater than 10 acres and 12 of these are owned and operated by NH state agencies. The dam maintenance records were reviewed for these dams and none of their operations were changed during the month of August 2003. Private dam and small dam operations were not investigated.

## **C-3 – Water Withdrawal Data**

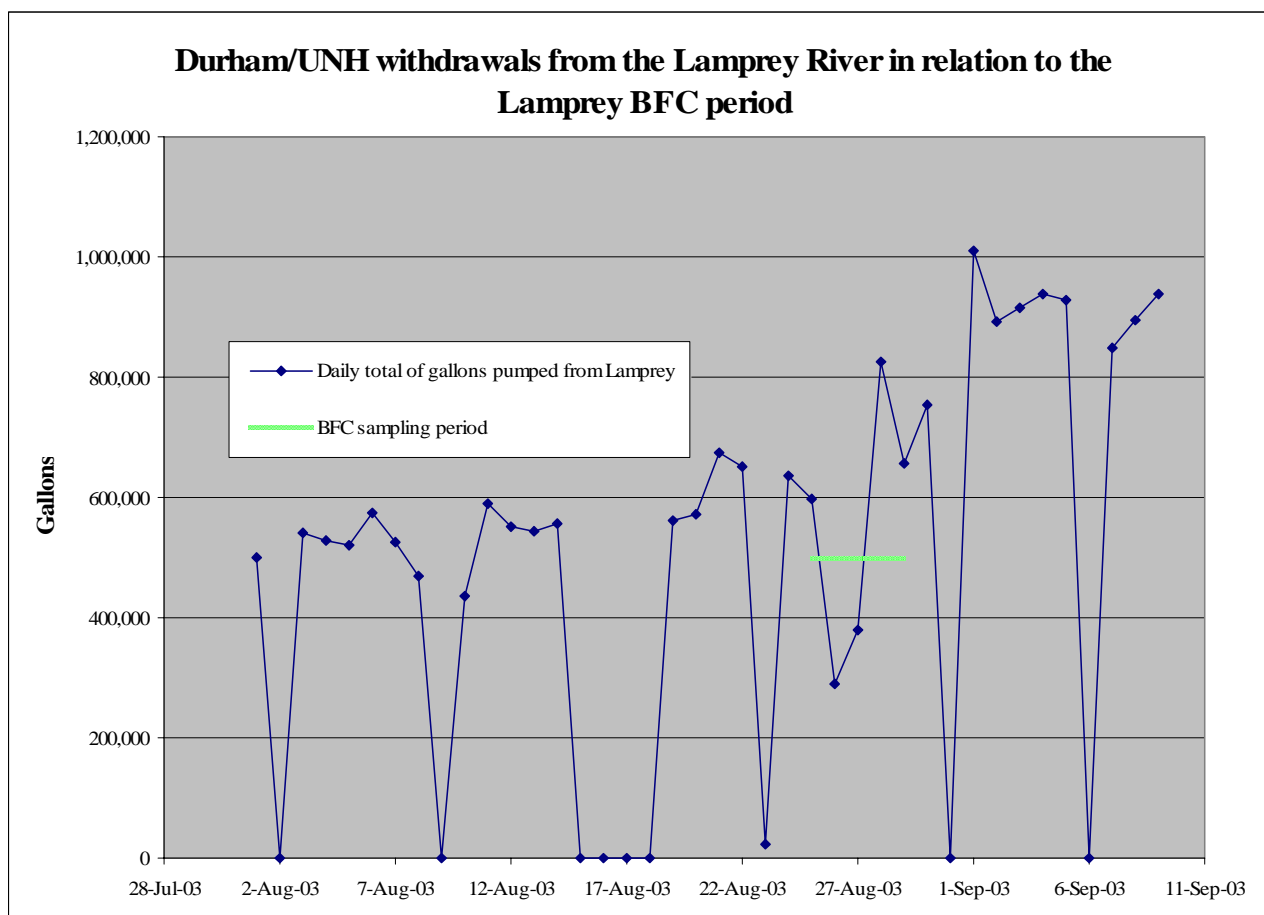
### **Withdrawals**

Water users withdrawing more than 140,000 gallons of water per week are required to register and report their monthly water use totals to the NH Department of Environmental Services (Table 4). There are seven active, registered water users withdrawing water in the Designated River watershed sometimes at more than one withdrawal point. Only the University of New Hampshire withdrawal occurs within the Designated River. UNH operates a surface water withdrawal about a half mile upstream of Wiswall Dam. This withdrawal occurs upstream of the stream gage on the Lamprey River. As reported by the Town of Durham, withdrawals (Table 3 and Figure 5) during the period August 11 through August 29 averaged 0.66 cfs (about 300 gallons per minute). The maximum daily withdrawal during this period was 825,000 gallons (average 1.28 cfs) on August 28 near the end of the BFC sampling period. Total water use for August 2003 by all registered withdrawals less the measured registered returns equaled 2.045 cfs (40,919,596 gallons) based on self-reported data.

**Table 3 - Water pumped from Lamprey River by UNH/Durham Water Works August 2003**

<b>Data from - Dufresne and Henry - engineers for Durham - sent via email 9/16/2003</b>			
<b>DATE:</b>	<b>Daily total of gallons pumped from Lamprey</b>	<b>DATE:</b>	<b>Daily total of gallons pumped from Lamprey</b>
1-Aug-03	498,900	21-Aug-03	673,800
2-Aug-03	0	22-Aug-03	650,900
3-Aug-03	541,000	23-Aug-03	21,900
4-Aug-03	529,000	24-Aug-03	636,700
5-Aug-03	519,600	25-Aug-03	598,500
6-Aug-03	573,900	26-Aug-03	289,700
7-Aug-03	524,400	27-Aug-03	379,500
8-Aug-03	469,000	28-Aug-03	825,200
9-Aug-03	0	29-Aug-03	656,900
10-Aug-03	436,400	30-Aug-03	755,000
11-Aug-03	590,300	31-Aug-03	0

12-Aug-03	551,500	1-Sep-03	1,010,100
13-Aug-03	542,900	2-Sep-03	892,700
14-Aug-03	557,100	3-Sep-03	916,000
15-Aug-03	0	4-Sep-03	937,900
16-Aug-03	0	5-Sep-03	928,700
17-Aug-03	Oyster River	6-Sep-03	0
18-Aug-03	Oyster River	7-Sep-03	847,800
19-Aug-03	560,900	8-Sep-03	896,100
20-Aug-03	572,800	9-Sep-03	938,500



**Figure 5 - Water withdrawals directly from the Lamprey Designated Reach**

**Table 4 - 2003 Lamprey Registered Water Users Monthly Water Use**

**2003 Lamprey Monthly Water Use in CFS (Source: NHDES Water Use Reporting Database)**

USERNAME	WUSD_ID	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SCENIC NURSERY INC	20747 20747-S03	0.000	0.000	0.000	0.000	0.000	0.012	0.012	0.012	0.000	0.000	0.000	0.000
SCENIC NURSERY INC	20747 20747-S02	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000
SCENIC NURSERY INC	20747 20747-S01	0.000	0.000	0.000	0.001	0.001	0.005	0.006	0.006	0.004	0.001	0.000	0.000
FERNALD LUMBER INC	20557 20557-S01	0.000	0.000	0.000	0.000	0.023	0.023	0.023	0.023	0.023	0.017	0.000	0.000
FERNALD LUMBER INC	20557 20557-D01	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EPPING WWTF	20389 20389-D01	(0.227)	(0.262)	(0.289)	(0.604)	(0.627)	(0.398)	(0.259)	(0.255)	(0.181)	(0.184)	(0.297)	(0.373)
RAYMOND WATER DEPARTMENT	20061 20061-S01	0.449	0.470	0.517	0.455	0.454	0.510	0.583	0.499	0.439	0.433	0.413	0.397
GREEN HILLS COMM WS (Transfer)	20351 20061-S01	0.121	0.121	0.121	0.068	0.068	0.068	0.778	0.778	0.804	0.000	0.000	0.000
EPPING WATER WORKS	20045 20045-S02	0.090	0.081	0.082	0.079	0.085	0.104	0.103	0.079	0.085	0.081	0.087	0.075
US End of Designated Reach													
NEWMARKET WATER WORKS	20057 20057-S02	0.134	0.009	0.095	0.096	0.101	0.215	0.359	0.335	0.336	0.350	0.266	0.395
UNIVERSITY OF NH WW	20066 20066-S02	0.000	0.000	0.000	0.000	0.835	0.751	0.886	0.889	0.918	1.072	0.738	0.005
NEWMARKET WATER WORKS	20057 20057-S05	1.014	1.006	1.079	0.771	1.135	0.426	0.000	0.000	0.000	0.000	0.000	0.000
NEWMARKET WATER WORKS	20057 20057-S04	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NEWMARKET WATER WORKS	20057 20057-S03	0.188	0.012	0.133	0.121	0.173	0.302	0.479	0.395	0.402	0.469	0.353	0.301

NEWMARKET WATER WORKS	20057 20057-S01	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EPPING WATER WORKS	20045 20045-S03	0.059	0.053	0.055	0.051	0.056	0.051	0.062	0.058	0.054	0.052	0.055	0.056
EPPING WATER WORKS	20045 20045-S01	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DS End of Designated Reach													

## **C-4 – Habitat Assessment Data**

Habitat assessments were made at backpack and barge stations. Assessments used EPA's Rapid Bioassessment Protocol. These assessments require the evaluation of various parameters by the field teams. Protocols with different bioassessment parameters for low gradient, mid-gradient and high gradient streams are available. No high gradient streams were identified in the study reach. Assessment sheets for mid-gradient and low gradient streams are attached.

Results for each parameter are numerical scores of either 0 to 20 or 0 to 10. Parameter results for each station are attached. Backpack station results are highlighted in green; barge station results are highlighted in yellow. Star diagrams of the results for the low gradient and mid-gradient stations are attached.

# Habitat Assessment Field Data Sheet Low Gradient Streams (Front)

Stream Name		Station #		
Investigators		Agency		
Form Completed By		Date ____ Time ____ AM PM	Reason for Survey	
Habit Parameter	Condition Category			
	Optimal	Sub optimal	Marginal	Poor
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30 - 50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10 - 30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Total Score \_\_\_\_

Does this value make sense? \_\_\_\_

Has the Total Score been entered into EDAS? \_\_\_\_ Initials \_\_\_\_ Date \_\_\_\_

Has this value in EDAS been QC'd? \_\_\_\_ Initials \_\_\_\_ Date \_\_\_\_

## Habitat Assessment Field Data Sheet Low Gradient Streams (Back)

<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable: evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>  Note: determine left or right side by facing downstream	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, under story shrubs, or non woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally	70-90% of the stream bank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining	50-70% of the stream bank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e.: parking lots, roadbeds, clear cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

**Lamprey BFC Low Gradient Habitat Assessment Station Results**  
**Backpack Stations are in green; Barge stations, yellow.**

StationID	Gradient	CollDate	HabParameter	HabValue	QC Date
03P-101	Low Gradient	8/28/2003	Epifaunal Substrate	17	9/23/2003
03P-101	Low Gradient	8/28/2003	Pool Substrate Characterization	16	9/23/2003
03P-101	Low Gradient	8/28/2003	Pool Variability	15	9/23/2003
03P-101	Low Gradient	8/28/2003	Sediment Deposition	13	9/23/2003
03P-101	Low Gradient	8/28/2003	Channel Flow Status	17	9/23/2003
03P-101	Low Gradient	8/28/2003	Channel Alteration	17	9/23/2003
03P-101	Low Gradient	8/28/2003	Channel Sinuosity	0	9/23/2003
03P-101	Low Gradient	8/28/2003	Bank Stability Left Bank	9	9/23/2003
03P-101	Low Gradient	8/28/2003	Bank Stability Right Bank	8	9/23/2003
03P-101	Low Gradient	8/28/2003	Bank Vegetative Protection Left Bank	9	9/23/2003
03P-101	Low Gradient	8/28/2003	Bank Vegetative Protection Right Bank	9	9/23/2003
03P-101	Low Gradient	8/28/2003	Riparian Vegetative Zone Width-Left Bank	10	9/23/2003
03P-101	Low Gradient	8/28/2003	Riparian Vegetative Zone Width-Right Bank	8	9/23/2003
03P-111	Low Gradient	8/25/2003	Epifaunal Substrate	18	9/23/2003
03P-111	Low Gradient	8/25/2003	Pool Substrate Characterization	17	9/23/2003
03P-111	Low Gradient	8/25/2003	Pool Variability	18	9/23/2003
03P-111	Low Gradient	8/25/2003	Sediment Deposition	18	9/23/2003
03P-111	Low Gradient	8/25/2003	Channel Flow Status	18	9/23/2003
03P-111	Low Gradient	8/25/2003	Channel Alteration	18	9/23/2003
03P-111	Low Gradient	8/25/2003	Channel Sinuosity	16	9/23/2003
03P-111	Low Gradient	8/25/2003	Bank Stability Left Bank	9	9/23/2003
03P-111	Low Gradient	8/25/2003	Bank Stability Right Bank	8	9/23/2003
03P-111	Low Gradient	8/25/2003	Bank Vegetative Protection Left Bank	9	9/23/2003
03P-111	Low Gradient	8/25/2003	Bank Vegetative Protection Right Bank	9	9/23/2003
03P-111	Low Gradient	8/25/2003	Riparian Vegetative Zone Width-Left Bank	10	9/23/2003
03P-111	Low Gradient	8/25/2003	Riparian Vegetative Zone Width-Right Bank	10	9/23/2003
03P-114	Low Gradient	8/26/2003	Epifaunal Substrate	2	9/23/2003
03P-114	Low Gradient	8/26/2003	Pool Substrate Characterization	7	9/23/2003

03P-114	Low Gradient	8/26/2003	Pool Variability	11	9/23/2003
03P-114	Low Gradient	8/26/2003	Sediment Deposition	4	9/23/2003
03P-114	Low Gradient	8/26/2003	Channel Flow Status	19	9/23/2003
03P-114	Low Gradient	8/26/2003	Channel Alteration	20	9/23/2003
03P-114	Low Gradient	8/26/2003	Channel Sinuosity	8	9/23/2003
03P-114	Low Gradient	8/26/2003	Bank Stability Left Bank	5	9/23/2003
03P-114	Low Gradient	8/26/2003	Bank Stability Right Bank	3	9/23/2003
03P-114	Low Gradient	8/26/2003	Bank Vegetative Protection Left Bank	7	9/23/2003
03P-114	Low Gradient	8/26/2003	Bank Vegetative Protection Right Bank	6	9/23/2003
03P-114	Low Gradient	8/26/2003	Riparian Vegetative Zone Width-Left Bank	9	9/23/2003
03P-114	Low Gradient	8/26/2003	Riparian Vegetative Zone Width-Right Bank	5	9/23/2003
03P-116	Low Gradient	8/27/2003	Epifaunal Substrate	2	9/23/2003
03P-116	Low Gradient	8/27/2003	Pool Substrate Characterization	7	9/23/2003
03P-116	Low Gradient	8/27/2003	Pool Variability	11	9/23/2003
03P-116	Low Gradient	8/27/2003	Sediment Deposition	5	9/23/2003
03P-116	Low Gradient	8/27/2003	Channel Flow Status	20	9/23/2003
03P-116	Low Gradient	8/27/2003	Channel Alteration	20	9/23/2003
03P-116	Low Gradient	8/27/2003	Channel Sinuosity	6	9/23/2003
03P-116	Low Gradient	8/27/2003	Bank Stability Left Bank	1	9/23/2003
03P-116	Low Gradient	8/27/2003	Bank Stability Right Bank	5	9/23/2003
03P-116	Low Gradient	8/27/2003	Bank Vegetative Protection Left Bank	3	9/23/2003
03P-116	Low Gradient	8/27/2003	Bank Vegetative Protection Right Bank	7	9/23/2003
03P-116	Low Gradient	8/27/2003	Riparian Vegetative Zone Width-Left Bank	3	9/23/2003
03P-116	Low Gradient	8/27/2003	Riparian Vegetative Zone Width-Right Bank	9	9/23/2003
03P-117	Low Gradient	8/27/2003	Epifaunal Substrate	7	9/23/2003
03P-117	Low Gradient	8/27/2003	Pool Substrate Characterization	15	9/23/2003
03P-117	Low Gradient	8/27/2003	Pool Variability	13	9/23/2003
03P-117	Low Gradient	8/27/2003	Sediment Deposition	13	9/23/2003
03P-117	Low Gradient	8/27/2003	Channel Flow Status	19	9/23/2003
03P-117	Low Gradient	8/27/2003	Channel Alteration	20	9/23/2003

03P-117	Low Gradient	8/27/2003	Channel Sinuosity	6	9/23/2003
03P-117	Low Gradient	8/27/2003	Bank Stability Left Bank	8	9/23/2003
03P-117	Low Gradient	8/27/2003	Bank Stability Right Bank	3	9/23/2003
03P-117	Low Gradient	8/27/2003	Bank Vegetative Protection Left Bank	6	9/23/2003
03P-117	Low Gradient	8/27/2003	Bank Vegetative Protection Right Bank	5	9/23/2003
03P-117	Low Gradient	8/27/2003	Riparian Vegetative Zone Width-Left Bank	10	9/23/2003
03P-117	Low Gradient	8/27/2003	Riparian Vegetative Zone Width-Right Bank	3	9/23/2003

## Habitat Assessment Field Data Sheet Mid Gradient Streams (Front)

Stream Name _____		Station # _____		
Investigators _____		Agency _____		
Form Completed By _____		Date _____ Time _____ AM PM		Reason for Survey _____

Habitat Parameter	Condition Category			
	Optimal	Sub optimal	Marginal	Poor

<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30 - 50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	10 - 30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>2. Pool Substrate Characterization</b>	Riffle substrate consists of gravel, cobble, and boulder particles that are 0-25% surrounded by fine sediment. Pool substrates are a mixture of substrate materials with little to no deposition of fines and gravel or cobble prevalent.	Riffle substrate consists of gravel, cobble, and boulder particles that are 25-50% surrounded by fine sediment. Pool substrates are a mixture of coarse to soft sand; some root mats and submerged vegetation may be present	Riffle substrate consists of gravel, cobble, and boulder particles that are 50-75% surrounded by fine sediment. Pool substrates are soft silts or mud; root mats and submerged vegetation may be common.	Riffle substrate consists of gravel, cobble, and boulder particles that are 75-100% surrounded by fine sediment. Pool substrate may be all mud with root mat and submerged vegetation abundant. Niche space severely limited.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>3. Velocity/Depth Regime</b>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is <0.3 m/s, deep is >0.5 m.)	Only 3 of the 4 regimes present, and the majority of pools are large deep, with very few shallow.	Only 2 of the 4 habitat regimes present, with shallow pools much more prevalent than deep pools.	Dominated by 1 velocity/depth regime with a few shallow pools or no pools present (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 10% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 10-40% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 40-70% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 70% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Total Score \_\_\_\_\_

Does this value make sense? \_\_\_\_\_

Has the Total Score been entered into EDAS? \_\_\_\_\_ Initials \_\_\_\_\_ Date \_\_\_\_\_

Has this value in EDAS been QC'd? \_\_\_\_\_ Initials \_\_\_\_\_ Date \_\_\_\_\_

## Habitat Assessment Field Data Sheet Mid Gradient Streams (Back)

<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Frequency of Riffles (or bends)</b>	Occurrence of riffles relatively frequent; variety of habitat is key.	Occurrence of riffles relatively infrequent.	Occasional riffle; bottom contours provide some habitat.	Generally all flat water or shallow riffles; poor habitat.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable: evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.  Note: determine left or right side by facing downstream	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, under story shrubs, or non woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally	70-90% of the stream bank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining	50-70% of the stream bank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e.: parking lots, roadbeds, clear cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

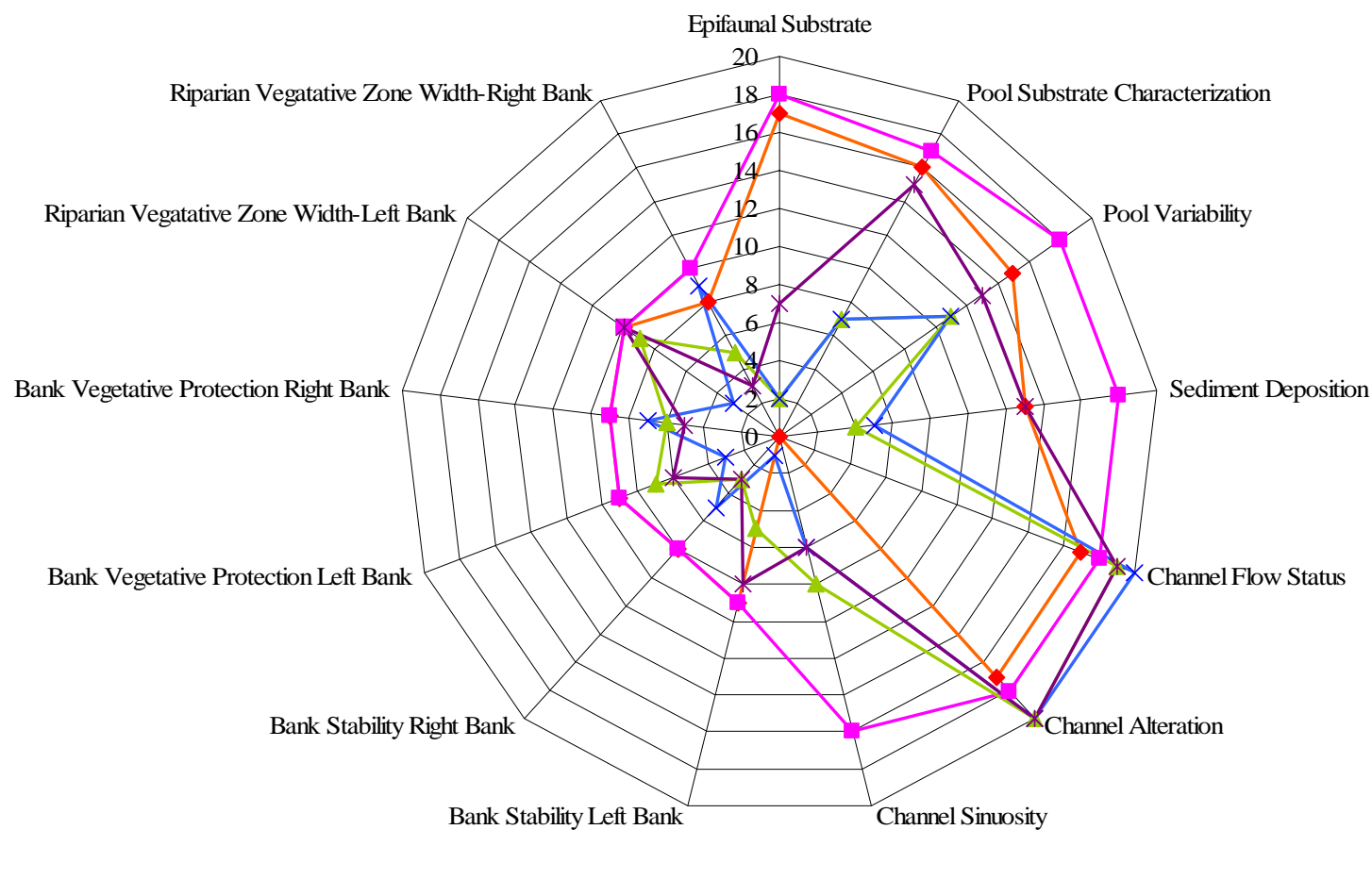
**Lamprey BFC Mid Gradient Habitat Assessment Station Results**  
**Backpack Stations are in green; Barge stations, yellow.**

StationID	Gradient	CollDate	HabParameter	HabValue	QC Date
03P-102	Mid Gradient	8/25/2003	Epifaunal Substrate	15	9/23/2003
03P-102	Mid Gradient	8/25/2003	Pool Substrate Characterization	16	9/23/2003
03P-102	Mid Gradient	8/25/2003	Velocity Depth Regime	16	9/23/2003
03P-102	Mid Gradient	8/25/2003	Sediment Deposition	18	9/23/2003
03P-102	Mid Gradient	8/25/2003	Channel Flow Status	19	9/23/2003
03P-102	Mid Gradient	8/25/2003	Channel Alteration	18	9/23/2003
03P-102	Mid Gradient	8/25/2003	Frequency of Riffles	18	9/23/2003
03P-102	Mid Gradient	8/25/2003	Bank Stability Left Bank	8	9/23/2003
03P-102	Mid Gradient	8/25/2003	Bank Stability Right Bank	9	9/23/2003
03P-102	Mid Gradient	8/25/2003	Bank Vegetative Protection Left Bank	9	9/23/2003
03P-102	Mid Gradient	8/25/2003	Bank Vegetative Protection Right Bank	9	9/23/2003
03P-102	Mid Gradient	8/25/2003	Riparian Vegetative Zone Width-Left Bank	7	9/23/2003
03P-102	Mid Gradient	8/25/2003	Riparian Vegetative Zone Width-Right Bank	9	9/23/2003
03P-103	Mid Gradient	8/26/2003	Epifaunal Substrate	15	9/23/2003
03P-103	Mid Gradient	8/26/2003	Pool Substrate Characterization	16	9/23/2003
03P-103	Mid Gradient	8/26/2003	Velocity Depth Regime	14	9/23/2003
03P-103	Mid Gradient	8/26/2003	Sediment Deposition	18	9/23/2003
03P-103	Mid Gradient	8/26/2003	Channel Flow Status	19	9/23/2003
03P-103	Mid Gradient	8/26/2003	Channel Alteration	20	9/23/2003
03P-103	Mid Gradient	8/26/2003	Frequency of Riffles	19	9/23/2003
03P-103	Mid Gradient	8/26/2003	Bank Stability Left Bank	9	9/23/2003
03P-103	Mid Gradient	8/26/2003	Bank Stability Right Bank	9	9/23/2003
03P-103	Mid Gradient	8/26/2003	Bank Vegetative Protection Left Bank	9	9/23/2003
03P-103	Mid Gradient	8/26/2003	Bank Vegetative Protection Right Bank	9	9/23/2003
03P-103	Mid Gradient	8/26/2003	Riparian Vegetative Zone Width-Left Bank	8	9/23/2003
03P-103	Mid Gradient	8/26/2003	Riparian Vegetative Zone Width-Right Bank	10	9/23/2003
03P-104	Mid Gradient	8/27/2003	Epifaunal Substrate	16	9/23/2003
03P-104	Mid Gradient	8/27/2003	Pool Substrate Characterization	14	9/23/2003

03P-104	Mid Gradient	8/27/2003	Velocity Depth Regime	17	9/23/2003
03P-104	Mid Gradient	8/27/2003	Sediment Deposition	17	9/23/2003
03P-104	Mid Gradient	8/27/2003	Channel Flow Status	19	9/23/2003
03P-104	Mid Gradient	8/27/2003	Channel Alteration	18	9/23/2003
03P-104	Mid Gradient	8/27/2003	Frequency of Riffles	17	9/23/2003
03P-104	Mid Gradient	8/27/2003	Bank Stability Left Bank	9	9/23/2003
03P-104	Mid Gradient	8/27/2003	Bank Stability Right Bank	9	9/23/2003
03P-104	Mid Gradient	8/27/2003	Bank Vegetative Protection Left Bank	9	9/23/2003
03P-104	Mid Gradient	8/27/2003	Bank Vegetative Protection Right Bank	9	9/23/2003
03P-104	Mid Gradient	8/27/2003	Riparian Vegetative Zone Width-Left Bank	9	9/23/2003
03P-104	Mid Gradient	8/27/2003	Riparian Vegetative Zone Width-Right Bank	10	9/23/2003
03P-105	Mid Gradient	8/27/2003	Epifaunal Substrate	16	9/23/2003
03P-105	Mid Gradient	8/27/2003	Pool Substrate Characterization	16	9/23/2003
03P-105	Mid Gradient	8/27/2003	Velocity Depth Regime	19	9/23/2003
03P-105	Mid Gradient	8/27/2003	Sediment Deposition	18	9/23/2003
03P-105	Mid Gradient	8/27/2003	Channel Flow Status	19	9/23/2003
03P-105	Mid Gradient	8/27/2003	Channel Alteration	19	9/23/2003
03P-105	Mid Gradient	8/27/2003	Frequency of Riffles	19	9/23/2003
03P-105	Mid Gradient	8/27/2003	Bank Stability Left Bank	9	9/23/2003
03P-105	Mid Gradient	8/27/2003	Bank Stability Right Bank	9	9/23/2003
03P-105	Mid Gradient	8/27/2003	Bank Vegetative Protection Left Bank	9	9/23/2003
03P-105	Mid Gradient	8/27/2003	Bank Vegetative Protection Right Bank	9	9/23/2003
03P-105	Mid Gradient	8/27/2003	Riparian Vegetative Zone Width-Left Bank	8	9/23/2003
03P-105	Mid Gradient	8/27/2003	Riparian Vegetative Zone Width-Right Bank	10	9/23/2003
03P-113	Mid Gradient	8/26/2003	Epifaunal Substrate	6	9/23/2003
03P-113	Mid Gradient	8/26/2003	Pool Substrate Characterization	5	9/23/2003
03P-113	Mid Gradient	8/26/2003	Velocity Depth Regime	9	9/23/2003
03P-113	Mid Gradient	8/26/2003	Sediment Deposition	8	9/23/2003
03P-113	Mid Gradient	8/26/2003	Channel Flow Status	19	9/23/2003
03P-113	Mid Gradient	8/26/2003	Channel Alteration	20	9/23/2003

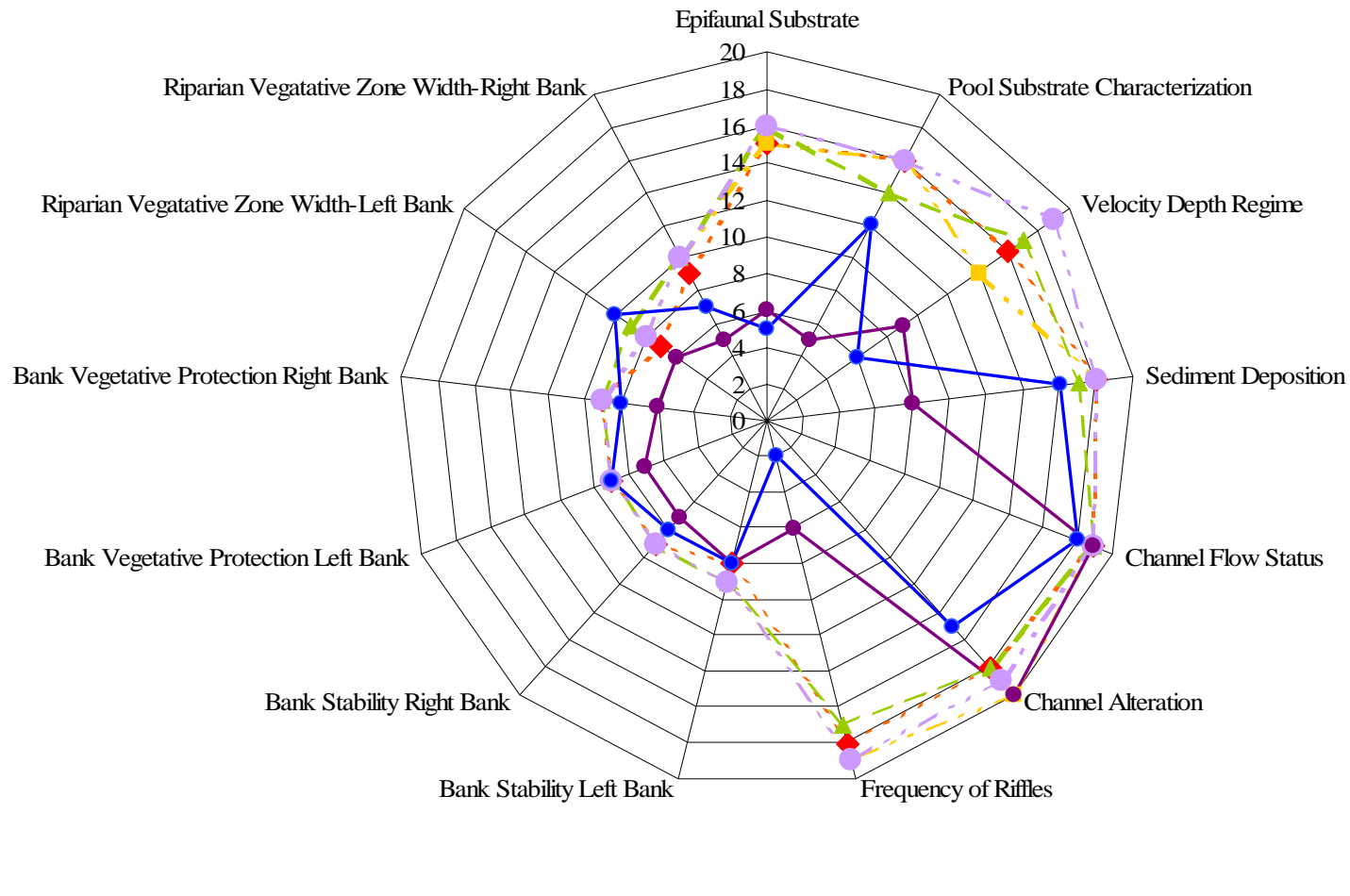
03P-113	Mid Gradient	8/26/2003	Frequency of Riffles	6	9/23/2003
03P-113	Mid Gradient	8/26/2003	Bank Stability Left Bank	8	9/23/2003
03P-113	Mid Gradient	8/26/2003	Bank Stability Right Bank	7	9/23/2003
03P-113	Mid Gradient	8/26/2003	Bank Vegetative Protection Left Bank	7	9/23/2003
03P-113	Mid Gradient	8/26/2003	Bank Vegetative Protection Right Bank	6	9/23/2003
03P-113	Mid Gradient	8/26/2003	Riparian Vegetative Zone Width-Left Bank	6	9/23/2003
03P-113	Mid Gradient	8/26/2003	Riparian Vegetative Zone Width-Right Bank	5	9/23/2003
03P-115	Mid Gradient	8/26/2003	Epifaunal Substrate	5	9/23/2003
03P-115	Mid Gradient	8/26/2003	Pool Substrate Characterization	12	9/23/2003
03P-115	Mid Gradient	8/26/2003	Velocity Depth Regime	6	9/23/2003
03P-115	Mid Gradient	8/26/2003	Sediment Deposition	16	9/23/2003
03P-115	Mid Gradient	8/26/2003	Channel Flow Status	18	9/23/2003
03P-115	Mid Gradient	8/26/2003	Channel Alteration	15	9/23/2003
03P-115	Mid Gradient	8/26/2003	Frequency of Riffles	2	9/23/2003
03P-115	Mid Gradient	8/26/2003	Bank Stability Left Bank	8	9/23/2003
03P-115	Mid Gradient	8/26/2003	Bank Stability Right Bank	8	9/23/2003
03P-115	Mid Gradient	8/26/2003	Bank Vegetative Protection Left Bank	9	9/23/2003
03P-115	Mid Gradient	8/26/2003	Bank Vegetative Protection Right Bank	8	9/23/2003
03P-115	Mid Gradient	8/26/2003	Riparian Vegetative Zone Width-Left Bank	10	9/23/2003
03P-115	Mid Gradient	8/26/2003	Riparian Vegetative Zone Width-Right Bank	7	9/23/2003

## Lamprey BFC Habitat Assessment Values - Low Gradient Stations



Note: Variables to the left have maximum scores of 10, while those to the right have maximum scores of 20.

## Lamprey BFC Habitat Assessment Values - Mid Gradient Stations



Note: Variables to the left have maximum scores of 10, while those to the right have maximum scores of 20.